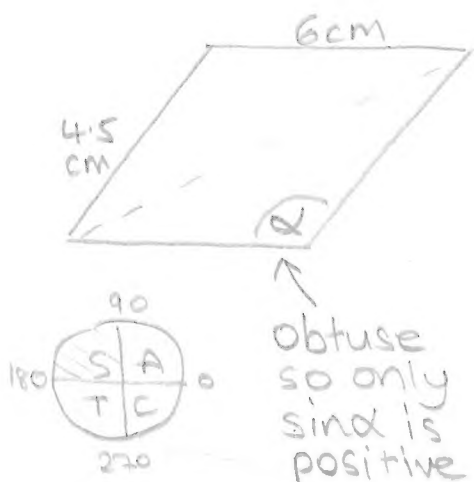


6 A parallelogram has sides of length 6 cm and 4.5 cm.

The larger interior angles of the parallelogram have size α

Given that the area of the parallelogram is 24 cm^2 , find the exact value of $\tan \alpha$

[4 marks]

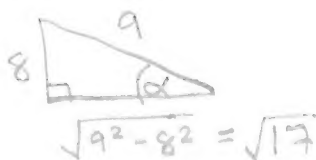


$$2 \times \frac{1}{2} ab \sin C = \text{Area}$$

$$\therefore 6 \times 4.5 \times \sin \alpha = 24$$

$$27 \sin \alpha = 24$$

$$\sin \alpha = \frac{24}{27} = \frac{8}{9}$$



$$\therefore \tan \alpha = -\frac{8}{\sqrt{17}}$$

7 Solve the equation

$$\sin \theta \tan \theta + 2 \sin \theta = 3 \cos \theta$$

where $\cos \theta \neq 0$

Give **all** values of θ to the nearest degree in the interval $0^\circ < \theta < 180^\circ$

Fully justify your answer.

[5 marks]

$$\sin \theta \tan \theta + 2 \sin \theta = 3 \cos \theta$$

$\div \cos \theta$

$$\frac{\sin \theta \tan \theta}{\cos \theta} + \frac{2 \sin \theta}{\cos \theta} = \frac{3 \cos \theta}{\cos \theta}$$

$$\tan^2 \theta + 2 \tan \theta = 3$$

$$\tan^2 \theta + 2 \tan \theta - 3 = 0$$

$$\therefore \tan \theta = 1 \quad \text{or} \quad \tan \theta = -3 \quad (\text{calc})$$

$$\theta = 45^\circ$$

$$\theta = -71.6^\circ \quad (\text{out of range})$$

$$\theta = -71.6^\circ + 180$$

$$\therefore \theta = \{45^\circ, 108^\circ\}$$

to the nearest degree.

12. (a) Solve, for $-180^\circ \leq x < 180^\circ$, the equation

$$3 \sin^2 x + \sin x + 8 = 9 \cos^2 x$$

giving your answers to 2 decimal places.

(6)

(b) Hence find the smallest positive solution of the equation

$$3 \sin^2(2\theta - 30^\circ) + \sin(2\theta - 30^\circ) + 8 = 9 \cos^2(2\theta - 30^\circ)$$

giving your answer to 2 decimal places.

(2)

$$a) \quad 3 \sin^2 x + \sin x + 8 = 9(1 - \sin^2 x)$$

$$3 \sin^2 x + \sin x + 8 = 9 - 9 \sin^2 x$$

$$12 \sin^2 x + \sin x - 1 = 0$$

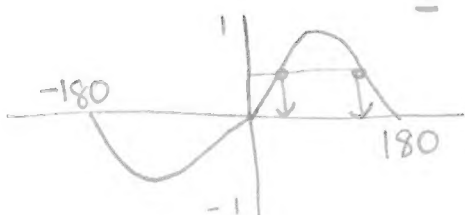
$$\therefore \sin x = \frac{1}{4} \text{ or } \sin x = -\frac{1}{3}$$

$$x = 14.478, \quad x = -19.471,$$

$$180 - 14.478$$

$$= 165.522$$

$$-180 + 19.471 = -160.529$$



$$\therefore \theta = \{ 14.48, 165.52, -19.47, -160.53 \}$$

to 2dp.

$$b) \quad 2\theta - 30 = -19.471 \quad \leftarrow \text{(will give the smallest +ve solution)}$$

$$2\theta = 10.529$$

$$\theta = 5.2645$$

\therefore Smallest possible solution
is $\theta = 5.26$ (to 2dp).